CLAIMS

What is claimed is:

1. (Currently amended) A diagnostic method, comprising the steps of:

exposing at least one sample location with excitation radiation through a single optical waveguide or a single optical waveguide bundle, wherein said sample emits emission radiation in response to said excitation radiation;

receiving at least a portion of said emission radiation from said sample location in said single optical waveguide or said single optical waveguide bundle, wherein said single optical waveguide or said single optical waveguide bundle provides co-registration of said excitation radiation and said emission radiation, and

generating a spectrum using synchronous luminescence, wherein a wavelength of said emission radiation (λ_{em}) and a wavelength of said excitation radiation (λ_{ex}) are simultaneously scanned ~~synchronously scanning a wavelength of said excitation radiation and a wavelength of said emission radiation to produce a spectrum~~.

2. (Original) The method of claim 1, further comprising the step of comparing said spectrum to a reference spectrum to identify at least one anomaly in said sample.

3. (Original) The method of claim 2, wherein said anomaly is selected from the group consisting of a disease state, a chemical, a biological species and an infectious agent.

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4. (Original) The method of claim 2, wherein said sample is a tissue sample, further comprising the step of determining the presence of cancer in said tissue sample.

5. (Original) The method of claim 1, further comprising the step of forming an image of said sample from said spectrum.

6. (Original) The method of claim 1, wherein said excitation radiation is an intensity-modulated electromagnetic excitation signal, further comprising the step of determining at least one lifetime from said sample.

7. (Original) The method of claim 6, wherein said intensity-modulated electromagnetic excitation signal comprises at least one radiation pulse, said radiation pulse having a pulse width shorter than said lifetime, wherein said lifetime is determined using time resolved spectroscopy.

8. (Original) The method of claim 7, wherein said at least one radiation pulse comprises a plurality of periodic pulses.

9. (Original) The method of claim 6, wherein said intensity-modulated electromagnetic excitation signal is modulated at a frequency greater than a reciprocal of said lifetime, wherein said lifetime is determined using phase-resolved spectroscopy.

10. (Currently amended) The method of claim 1, wherein said ~~synchronously scanning~~ generating step comprises maintaining a constant interval between said wavelength of said excitation radiation and ~~a~~ said wavelength of said emission radiation.

11. (Currently amended) The method of claim 1, wherein said ~~synchronously scanning~~ generating step comprises directing broadband excitation radiation into a first acousto-optic tunable filter (AOTF), and varying an input radio frequency to said first filter to achieve a range of wavelengths of said excitation radiation.

12. (Original) The method of claim 11, wherein said step of scanning a wavelength of said excitation radiation comprises directing said excitation radiation to a first AOTF and applying a radio frequency signal to said first AOTF to achieve a range of said excitation wavelengths.

13. (Original) The method according to claim 12, wherein said step of scanning a wavelength of said emission radiation comprises directing said emission radiation to a second AOTF and applying a radio frequency signal to said second AOTF to achieve a range of said emission wavelengths.

14. (Currently amended) The method of claim 1, wherein said ~~synchronously scanning~~ generating step comprises utilizing a non-constant interval between said wavelength of said excitation radiation and said wavelength of said emission radiation.

15. (Currently amended) A system for testing samples, comprising:

an excitation radiation source for generating excitation radiation;

a single optical waveguide or a single optical waveguide bundle for transmitting said excitation radiation to at least one sample location, said sample emitting emission radiation in response to said excitation radiation which is received by said single optical waveguide or a single optical waveguide bundle, wherein co-registration of said excitation radiation and said emission radiation is provided, and

structure for generating a spectrum using synchronous luminescence comprising structure for simultaneously scanning a wavelength of said emission radiation (λ_{em}) and a wavelength of said excitation radiation (λ_{ex}) ~~synchronously scanning a wavelength of said excitation radiation and a wavelength of said emission radiation to produce a spectrum~~.

16. (Original) The system of claim 15, further comprising structure for modulating said excitation radiation to produce intensity-modulated excitation radiation.

17. (Original) The system of claim 16, further comprising signal processing circuitry for receiving said emission radiation and determining spectroscopic data including at least one lifetime of said sample.

18. (Original) The system of claim 17, wherein said intensity-modulated excitation radiation comprises at least one radiation pulse, said radiation pulse having a

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pulse width shorter than said lifetime, wherein said lifetime is determined by said signal processing circuitry using time resolved spectroscopy.

19. (Original) The system of claim 18, wherein said at least one radiation pulse comprises a plurality of periodic pulses.

20. (Original) The system of claim 17, wherein said intensity-modulated excitation radiation has a frequency greater than a reciprocal of said lifetime, wherein said lifetime is determined by said signal processing circuitry using phase-resolved spectroscopy.

21. (Original) The system of claim 15, wherein said excitation radiation source is a broadband source, structure for synchronously scanning comprising a first acousto-optic tunable filter (AOTF) having a variable input radio frequency selected to achieve a range of excitation wavelengths.

22. (Currently amended) The system of claim 21, wherein said structure for generating a spectrum using synchronous luminescence ~~synchronously scanning~~ further comprises a second acousto-optic tunable filter (AOTF) having a variable input radio frequency selected to achieve a range of emission wavelengths.

23. (Original) The system of claim 15, further comprising a detector for imaging said emission radiation.

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24. (Original) The system of claim 23, wherein said detector is an intensified charge-coupled device (ICCD).

25. (Original) The system of claim 24, further comprising a control system for synchronizing said excitation radiation with detection of said emission radiation by said detector.

26. Cancelled